REMARKS

Claims 1-4, 11, 18 and 20 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Cheng et al. (U.S. Patent 6,541,382) in view of Ballantine (U.S. Patent 6,417,070). This rejection is respectfully traversed for the following reasons.

Claim 1 recites "patterning a silicon oxynitride layer having a composition $Si_XO_YN_ZH_A$" and "conditioning the patterned silicon oxynitride layer such that the silicon oxynitride layer has a composition $Si_XO_{Y+}N_ZH_{A-}$, wherein no wet clean step is performed between the etching of the trench and the conditioning of the patterned silicon oxynitride layer".

In contrast, Cheng et al. teach that a "silicon oxynitride ARC 16 is … partially oxidized to form a silicon oxide layer 70b on the ARC surface". (Cheng et al., Col. 8, lines 20-22.) That is, Cheng et al. teach that a portion of a silicon oxynitride ARC 16 is converted to silicon oxide. (Cheng et al., Col. 8, lines 22-24.) Cheng et al. therefore teach two distinct layers having different compositions, namely, a silicon oxide layer 70b and a silicon oxynitride ARC 16. Cheng et al. fail to teach that the composition of the remaining portion of silicon oxynitride ARC 16 is modified. Consequently, Cheng et al. fail to teach "conditioning the patterned silicon oxynitride layer such that the silicon oxynitride layer has a composition $Si_XO_{Y+}N_ZH_{A-}$" as recited by Claim 1.

The Examiner argues that using the rapid thermal oxidation described by Ballantine et al. in place of the rapid thermal oxidation described by Cheng et al. would remedy the deficiencies of Cheng et al. More specifically, the Examiner argues that "the RTA step of Ballantine would

increase the oxygen content and decrease the hydrogen content of the oxynitride film".

Applicant first notes that there is no motivation to use the rapid thermal oxidation step of Ballantine et al. with the teachings of Cheng et al. Cheng et al. teach "a sacrificial silicon oxide layer 70a is grown on the exposed silicon surfaces by rapid thermal oxidation by rapid thermal oxidation". (Cheng et al., Col. 8, lines 12-14.) Cheng et al. further provide the following specific requirement for the rapid thermal oxidation step: "The sacrificial oxide thickness is chosen to be sufficient to convert most of the silicon oxynitride ARC 16 into silicon oxide so that, after the final trench liner oxide is subsequently grown, all of the remaining oxynitride ARC will have been converted into silicon oxide." (Cheng et al., Col. 8, lines 22-26.)

Ballantine et al. teach "the rapid thermal oxidation is preferably carried out at temperatures of about 900 to about 1300°C, and more preferably about 1050 to about 1200°C. The process is typically carried out in less than 3 minutes, more typically about 1 second to less than 3 minutes, and preferably about 20 seconds to about 1 minute". (Ballantine et al., Col. 2, lines 33-38.)

There is no teaching or suggestion that the rapid thermal oxidation parameters disclosed by Ballantine et al. would meet the above-recited requirements of Cheng et al. That is, there is no teaching that a rapid thermal oxidation using the parameters taught by Ballantine et al. would result in a "sacrificial oxide thickness … sufficient to convert most of the silicon oxynitride ARC 16 into silicon oxide" as required by Cheng et al. For this reason, one of ordinary skill in the art would not have motivation to use

the rapid thermal oxidation of Ballantine et al. with the process of Cheng et al.

In addition, the Examiner makes the assertion that "the RTA step of Ballantine would increase the oxygen content and decrease the hydrogen content of the oxynitride film". However, Ballantine et al. do not teach or suggest that the described rapid thermal oxidation step would increase the oxygen content or decrease the hydrogen content of an oxynitride film. In fact, Ballantine et al. do not even disclose the use of an oxynitride film. Moreover, there is no teaching in either Cheng et al. or Ballantine et al. to suggest that an increase in oxygen content and a decrease in hydrogen content of an oxynitride film would be desirable. All of this information is found in Applicant's specification. The Examiner is therefore improperly using Applicant's specification as justification for combining Cheng et al. and Ballantine et al.

In addition, the Examiner's rejection relies on the third embodiment of Cheng et al., which includes silicon oxide layers 70a and 70b. (Cheng et al., Col. 7 line 60 to Col. 9, line 6.) However, Cheng et al. explicitly indicate that "A third embodiment of the invention is similar to the second embodiment but omits the recession of the silicon nitride". (Emphasis added.) (Cheng et al., Col. 7, lines 60-62.)

In contrast, Ballantine et al. teach an etch that "results in lateral erosion (PB) of the [silicon nitride] layer 3". (Ballantine et al., Col. 2, lines 9-10 and 21-22.) Because Ballantine et al. teaches the lateral erosion of the silicon nitride layer, and the third embodiment of Cheng et al. teaches that there should be no lateral erosion

of the silicon nitride layer, it is improper to combine Ballantine et al. with the third embodiment of Cheng et al.

For the foregoing reasons, Claim 1 is allowable over Cheng et al. in view of Ballantine et al. Claims 2-4, 11, 18 and 20, which depend from Claim 1, are allowable over Cheng et al. in view of Ballantine et al. for at least the same reasons as Claim 1.

In addition, Claim 20 recites "wherein the wet clean step does not react with the conditioned silicon oxynitride layer". In accordance with the Examiner's rejection, silicon oxide layer 70b must correspond with "a conditioned silicon oxynitride layer" as recited by Claim 1. However, Cheng et al. teach "the wafer 10 is next dipped into dilute aqueous HF to remove the sacrificial oxide 70a and the portion 70b of the ARC which was converted to silicon oxide." (Emphasis added.) (Cheng et al., Col. 8, lines 27-29.) Because Cheng et al. teach that "the portion 70b of the ARC which was converted to silicon oxide" is removed by the wet clean step, Cheng et al. fail to teach "the wet clean step does not react with the conditioned silicon oxynitride layer" as recited by Claim 20. For this additional reason, Claim 20 is allowable over Cheng et al. in view of Ballantine et al.

Claims 12-17 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Cheng et al. in view of Ballantine et al. and Wolf. This rejection is respectfully traversed in view of for the following reasons.

Claims 12-17, which depend from Claim 1, are allowable over Cheng et al. and Ballantine et al. for at least the same reasons as Claim 1. Because Wolf does not remedy the above-described deficiencies of Cheng et al. and Ballantine

et al., Claims 12-17 are is allowable over Cheng et al. in view of Ballantine et al. and Wolf.

## CONCLUSION

Claims 1-4 and 11-20 are pending in the present application. Reconsideration and allowance of these claims is respectfully requested. If the Examiner has any questions or comments, he is invited to call the undersigned at (925) 895-3545.

Respectfully submitted,

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